

WATSON

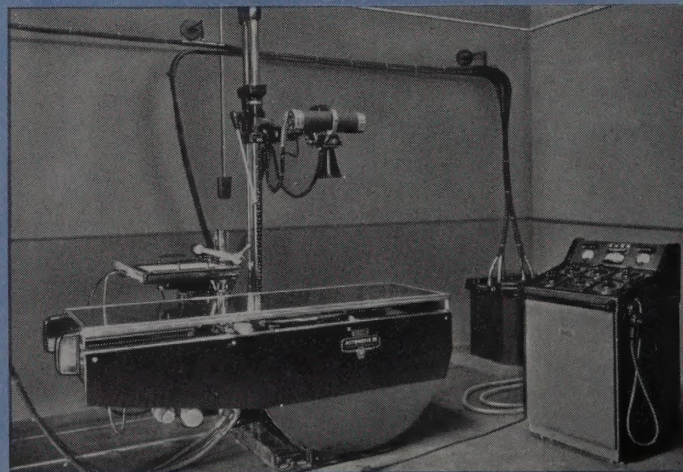
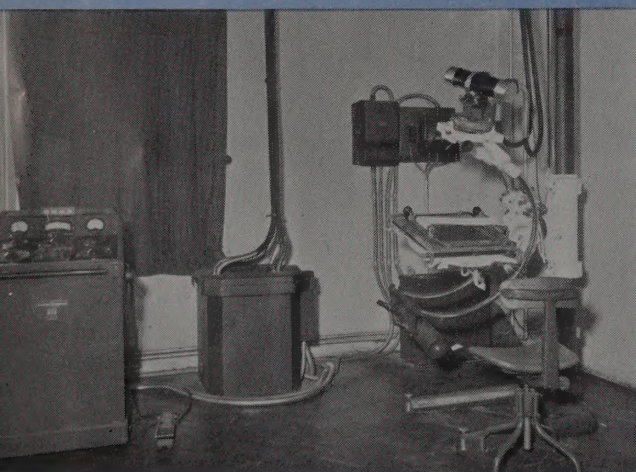
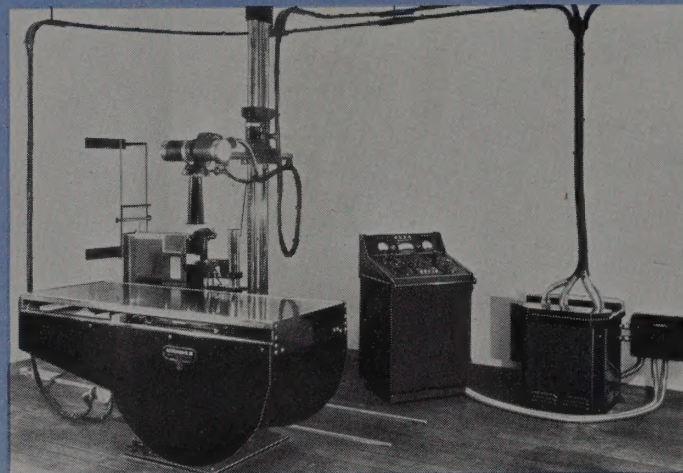
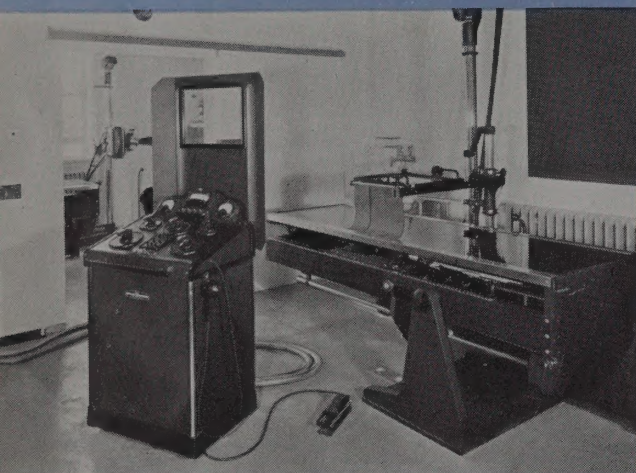
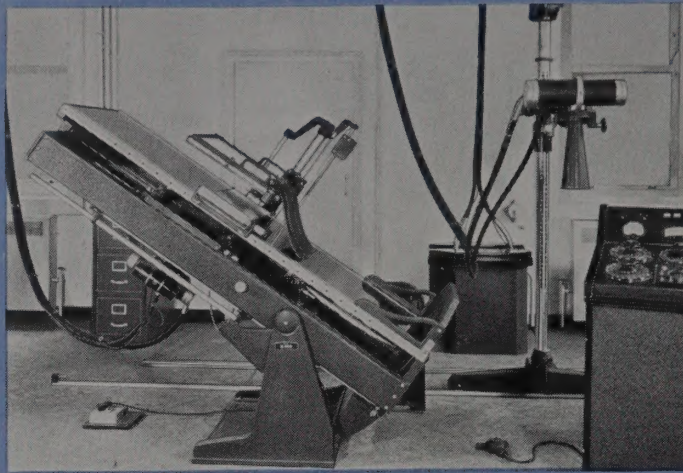
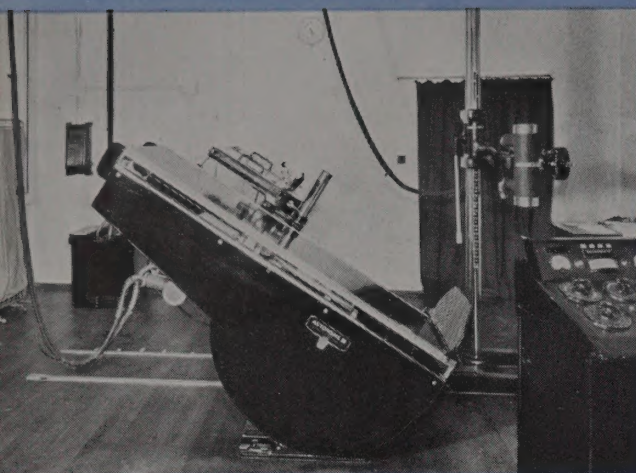
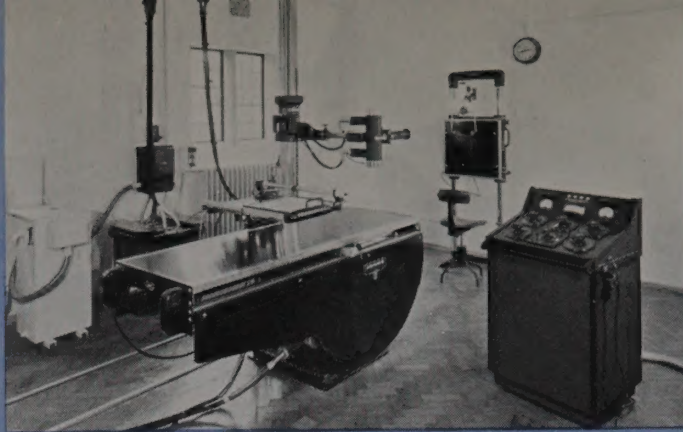
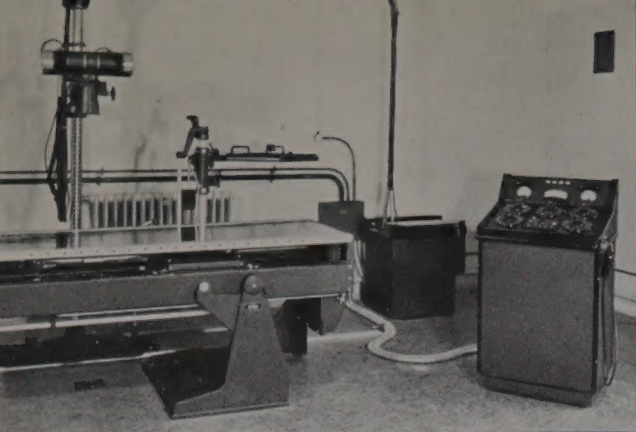
British made
X-RAY APPARATUS



ROENTGEN IV
HIGH TENSION
GENERATOR

SERIES 9

WATSON & SONS (ELECTRO-MEDICAL) LTD



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THE above photographs show some modern x-ray installations in which the "Roentgen IV" generator is used in conjunction with other Watson equipment. Commencing with the top left-hand picture: Mogerhanger Park Sanatorium, Midhurst Sanatorium, Whittington Hospital, The London Hospital, Broomfield County Hospital, St. Thomas's Hospital, Johannesburg Hospital, G. I. P. Railway Hospital, Bombay.



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WATSON ROENTGEN IV SERIES 9

MOST readers will already know the Roentgen IV either from first-hand experience or by repute for it will be found in use in x-ray departments throughout the world and is in Great Britain the most widely specified apparatus of its type.

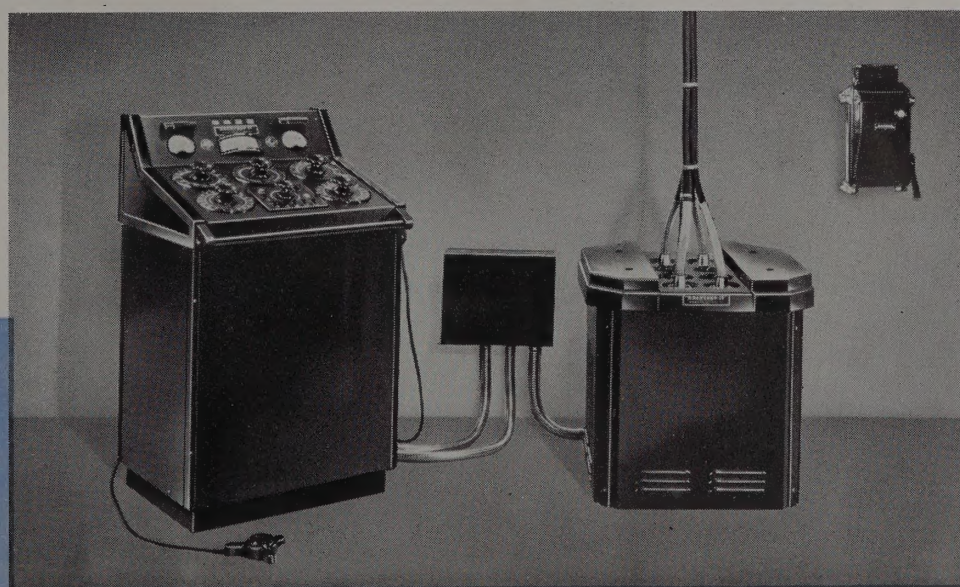
The initial success of the Roentgen IV was largely attributable to the fact that it was the first British-made apparatus to incorporate fully automatic control. It was soon found, however, that in addition it attained a hitherto unapproached standard of reliability and, moreover, that its use prolonged the life of x-ray tubes and cables. More important still, it had a profound influence on radiographic quality.

Resulting from its ready acceptance by the Profession, the Roentgen IV was manufactured in series after series several of which incorporated some minor improvement on the one preceding, whilst retaining the basic design to which the apparatus owes its success.

The present model (Series 9) is fully in line with present-day radiographic practice; it is the generator of choice for the x-ray department where the requirements are exacting and the volume of work heavy.

The salient features of the Roentgen IV are described in the following pages and information on its use in particular circumstances will gladly be supplied on request. As with all other Watson products, the apparatus is fully guaranteed and suitable for use in all climatic conditions, whilst exceptionally good facilities for installation and service exist in principal cities throughout the world.

*This equipment is approved by the
Canadian Standards Association Approvals Laboratories.*



SPECIFICATION

THE apparatus comprises a high tension generator employing full wave rectification and capable of delivering loads up to 400 mA at 100 kVp.

Whilst this high output is of course greater than is needed for the operation of the most powerful types of x-ray tubes available for normal use at the present time, it anticipates possible future developments. As at present supplied, the generator is usually adjusted to yield 400 mA at 90 kVp.

Any number of x-ray tube foci up to four may be energised in the following combinations:—

- Up to four single focus tubes.
- One or two double focus tubes.
- One double focus and one single focus tube.
- One double focus and two single focus tubes.

THE CONTROL TABLE

The control is of convenient size and mounted on dual, self-aligning castors. It is connected to the transformer via a junction box by cables enclosed in flexible chromium plated tubing, 12 feet (3.6 metres) in length.

The control embodies many special features including *Straight Line Automatic Control* and a Static Stabiliser which automatically ensures constant tube current irrespective of fluctuations in line voltage.



It is an inherent feature of any high-power x-ray tube that for slight variations of filament current considerable variations of tube high tension current will be experienced, thereby causing inconsistent radiographic results. Of the various means adopted to combat this effect, the system employed in the "Roentgen IV" has proved to be the most satisfactory because whilst ensuring efficient loading of the tube or tubes in use, it offers complete reliability and conserves tube life.

With *Straight Line Automatic Control* all previous disadvantages are overcome—the tube current stays sensibly constant at its pre-determined value over the entire kilovoltage range—the kilovoltage given by each stud is a specified value, engraved on the dial, and it remains constant at that value irrespective of changes in milliamperage and local conditions of line resistance. In addition, the time control is so arranged that no matter which tube, kilovoltage or time is selected, *the tube is never loaded beyond its safe limit.* With all these safeguards, however, the operator is still allowed sufficient freedom of choice of radiographic factors to enable allowances to be made for variations in individual cases.

Provision is made for automatic control, not only of tube loadings, but also for synchronising the electrical release of ancillary equipment such as a Potter-Bucky Diaphragm, Serial Plate Changer or Sctograph attachment for tomography.

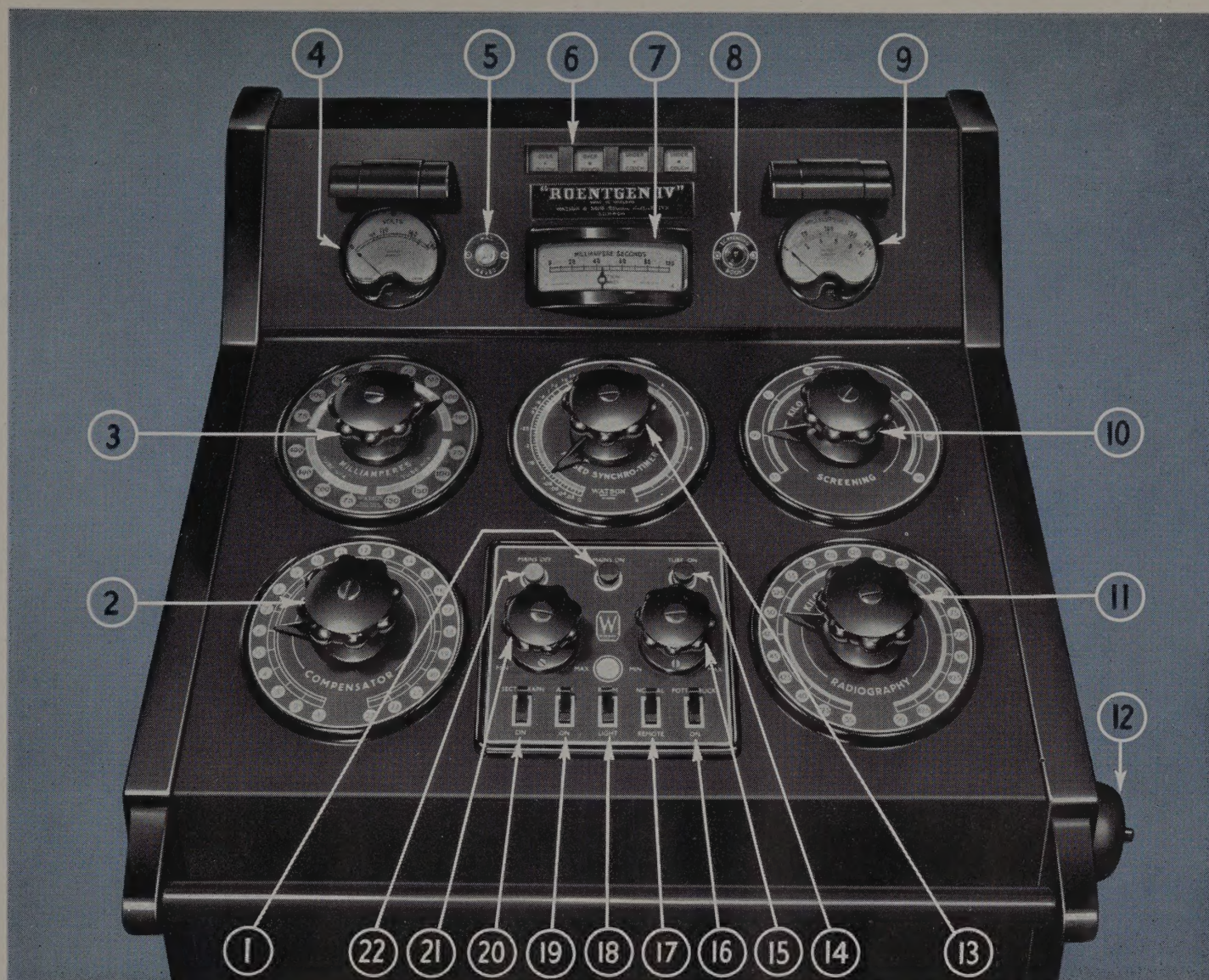
The controls and instruments are shown in the illustration on page 5. Those calling for special mention are as follows:—

PHASED SYNCHRO-TIMER (*Patent No. 517, 349*).

The Phased Synchro-Timer working in conjunction with a high speed contactor of new design, affords throughout its range (0.02–8 sec.) a greater degree of accuracy than any previous timer. The 6-inch dial

Continued on page 6

The exposure switch has a dual-action press-button. Initial pressure boosts tube filaments and energises stators and full pressure makes the exposure. Repeat exposures are made without re-setting the timer.



THE CONTROL PANEL

1. MAINS "ON" PUSH BUTTON—energises the combined circuit breaker and mains switch.
2. LINE COMPENSATOR SWITCH.
3. mA AND TUBE SELECTOR SWITCH. Interlinked with timer to prevent overloading tube.
4. COMPENSATOR VOLTMETER.
5. mAS METER RESET BUTTON.
6. PILOT LIGHTS—indicate the tube focus in use.
7. MILLIAMPERE-SECONDS METER—Records the product of tube current and time for exposures up to 0.5 second.
8. mA BOOST PUSH BUTTON—increases the tube current during fluoroscopy for a limited period.
9. MILLIAMMETER—has two ranges 0–10 mA for fluoroscopy and 0–200 mA for radiography.
10. KILOVOLTAGE CONTROL, FLUOROSCOPY—the peak kilovoltage of each position is engraved on the dial.
11. KILOVOLTAGE CONTROL, RADIOGRAPHY—has 23 steps 2.5 kV. apart. Engraved in kVp.
12. HANDSWITCH. A 2-stage control with "prepare" and "expose" positions.
13. PHASED SYNCHRO-TIMER—Range 0.02 to 8 seconds. Electrically interlocked to prevent tube ratings being exceeded.
14. "TUBE ON" PUSH BUTTON.
15. mA CONTROL, FLUOROSCOPY.
16. POTTER-BUCKY DIAPHRAGM SWITCH.
17. REMOTE CONTROL SWITCH.
18. ROOM LIGHTS SWITCH. A luminous disc enables the switch to be located after fluoroscopy.
19. AUXILIARY SWITCH—to control additional auxiliary apparatus.
20. SECTOGRAPH SWITCH for tomography.
21. PANEL LIGHTS DIMMER.
22. MAINS "OFF" PUSH BUTTON.

FOOTSWITCH (not illustrated)—used only on fluoroscopy. Can be connected to switch off the red room lights.

SPECIFICATION—continued

has an open scale which permits rapid and accurate setting, especially on fractional second exposures.

The contacts of the timeswitch are interlocked with the tube and mA selector switch in such a way that it is impossible to make an exposure if the timer is set to a value greater than that which the tube in circuit can safely withstand. For repeat exposures of identical duration, as in serial radiography, it is not necessary to reset the timer.

COMBINED TUBE AND mA SELECTOR

(Patent No. 522,136)

This control actuates the high tension switch in the H.T. transformer unit for selecting the required tube focus.

It also selects any one of the four pre-set milli-ampere values for each tube focus. In addition, air circulators and tube stators (if any) are automatically energised.

The different tube current settings on the scale are distinctively coloured, and a corresponding colour on the dial of the synchro-timer indicates to the operator at a glance the maximum exposure which may be used for the tube focus in use. This colour guide

serves only to facilitate the operation, however, because an interlocking arrangement makes it impossible to energise any tube focus unless the values selected are within the maximum ratings.

“ ON ” PRESS BUTTON

When the button is pressed, the filaments of the selected tube and the rectifying valves are heated to a low temperature thereby conserving the life of the filaments. When the tube and mA selector is moved to another position a relay is tripped thus avoiding further unnecessary heating of the tube filaments. This also makes it impossible to switch from one tube to another whilst the high-tension current is switched on, since the exposure circuits are immediately de-energised.

The tube indicators are also switched out when the tube and mA selector is operated, and switched on again by pressing the “ On ” button.

kV CONTROL

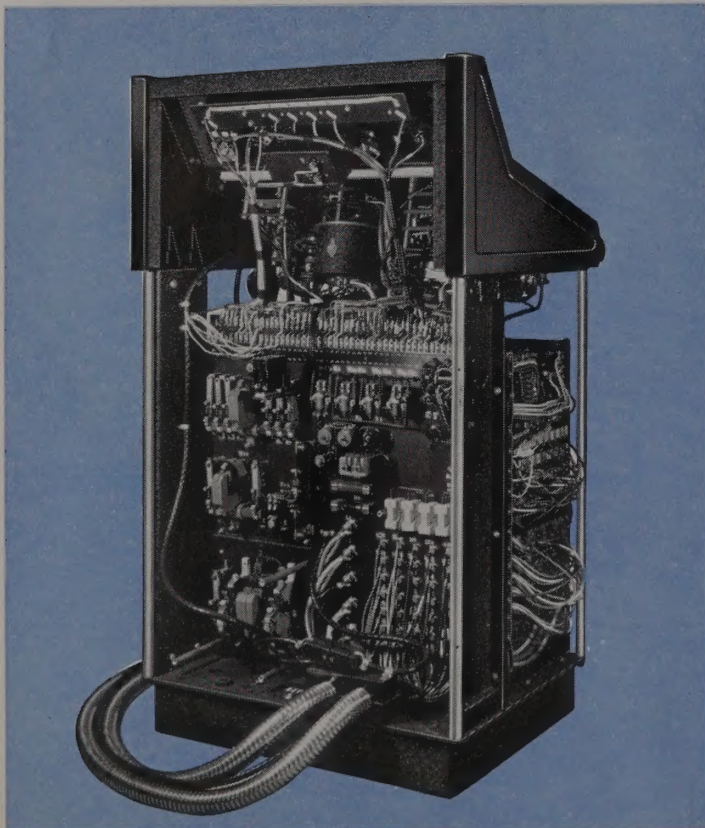
The actual values of kilovoltage obtained are inscribed on the dial and, regardless of changes in mA values, the kilovoltage is always substantially that to which the pointer is set. The 20 steps are 2.5 kV apart and the normal range is 40 to 90 kVp.

HANDSWITCH

A new type of exposure handswitch is connected to the control table by a flexible lead. It will be seen from the illustration on page 4 that the handswitch has two concentrically arranged press buttons; when the centre (red) button is pressed, the tube and valve filaments are boosted to their radiographic values and the tube stator (if any) is energised. A delay relay in the control table prevents the exposure being made (by pressing the outer button) until the elapse of about a second to enable the filaments to become fully heated and for the tube rotor to attain sufficient speed.

Normally, the exposure is made by pressing both buttons simultaneously, but when the radiographer wishes to make the exposure at a precise instant (as when dealing with children) the centre button only is pressed and held until conditions are favourable for initiating the exposure.

Rear view of the control unit with the panels removed: accessibility for servicing is a feature which appeals particularly to overseas users.



FLUOROSCOPY

A footswitch controls the current and (when suitably connected) automatically switches off the red or low-intensity room lights. The current may be adjusted continuously up to 5 mA, and, if a fluorescent image of increased brilliance is required for a short period, up to 10 mA may be obtained by pressing the boost button. As a precaution against excessively irradiating the patient or overloading the x-ray tube, a delay device automatically terminates the boost after a period adjustable up to 30 seconds, but then allows fluoroscopy to continue at the normal current.

Rapid changeover from radiography to fluoroscopy is effected with the utmost simplicity by operating the handswitch or footswitch as required. When a serial changer of suitable design is in use, fluoroscopy and radiography can be controlled by electrical contacts or remote push button.

mA/SECONDS METER

This meter, of the quantic type, operates automatically on short exposures up to 0.5 second, the needle remaining at the value obtained until reset. It is thus invaluable for checking fractional second exposures. Resetting is effected electrically.

When the exposure is sufficiently long to enable a reading to be taken on the mA meter, the mA/seconds meter is automatically cut out of circuit.

POTTER-BUCKY DIAPHRAGM SWITCH

By means of this switch a Potter-Bucky diaphragm of the normal or reciprocating type may be placed in circuit and released merely by operating the hand-switch. The system employed is such that:

- (a) If the diaphragm has not been set, no exposure will be made.
- (b) If the diaphragm (of the normal type) is set for a time of travel slightly longer than the exposure time needed, it will initiate the exposure and the timeswitch will switch off at the end of the preset period.

- (c) If, inadvertently, the diaphragm is set for a time of travel slightly shorter than the time of exposure, it will initiate the exposure and switch off just before the grid comes to rest, thereby preventing the production of grid lines due to the grid coming to rest during the exposure.

ROOM LIGHT SWITCH

This is a two-way switch incorporated in the control unit so that the main room light may be controlled by the wall switch, or alternatively, at the control table itself irrespective of the position of either switch.

MAINS SUPPLY

The Roentgen IV is designed to operate on mains supplies of 100–500 volts, 50 cycles. Units for use on 40 or 60 cycle supplies can be supplied to special order. Full details of wiring requirements are supplied for the use of electrical contractors before installation.

FINISH

The finish is in high grade black stoved enamel and chromium plate. It is easily maintained in new condition.

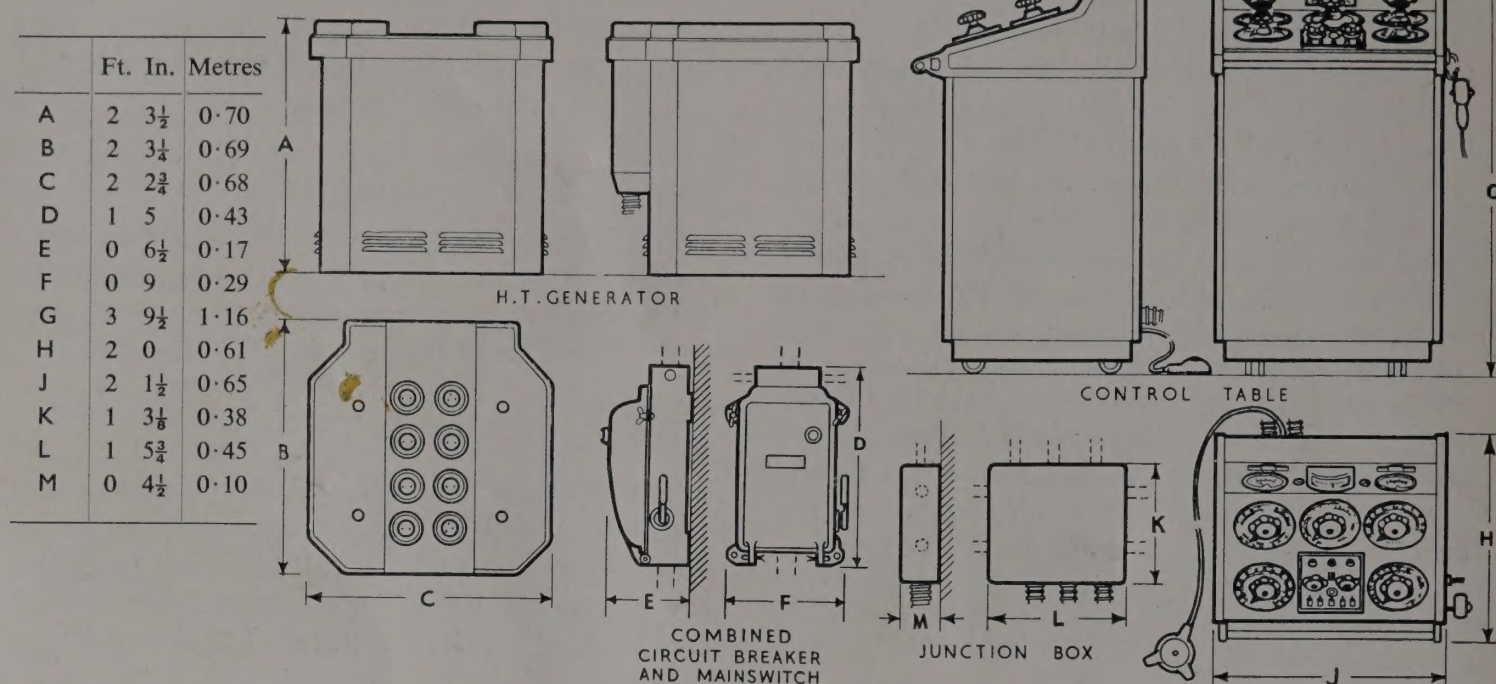
ORDERING INFORMATION

- Cat. No.*
- 222/1 "ROENTGEN IV" four-valve Generator with mobile Control Table, Static Stabiliser, Footswitch, Wall Contactor, and Junction Box.
 - 622/V12 MACHLETT RECTIFYING VALVES for use with above (four required).
 - 577/1 PHASE and VOLT REDUCING TRANSFORMER (Static Balancer) converting three phase supplies to low voltage single phase.
 - 222/3 Additional JUNCTION BOX (if required).
 - 621/61 PROTECTIVE SCREEN for attachment to Control Unit.

Whilst every care is taken to ensure the accuracy of the descriptions and illustrations in this publication, Watson & Sons (Electro-Medical) Limited reserve the right to make such alterations in the design of the apparatus as they may consider to be in the interest of the customer. All orders are accepted subject to the Company's printed Conditions of Sale.

DIMENSIONS

(APPROXIMATE)



SHIPPING INFORMATION

	Dimensions	Net Weight (Approx.)	Gross Weight (Approx.)
Control Unit	2' 11" × 2' 11" × 4' 8" (89 × 89 × 142 cm.)	4 3 0 (241 kg.)	6 2 0 (330 kg.)
Transformer and Top	2' 7" × 2' 8" × 3' 1" (78 × 81 × 93 cm.)	4 2 0 (228 kg.)	6 0 0 (304 kg.)
Boost Transformer	2' 6" × 1' 6" × 1' 6" (76 × 45 × 45 cm.)	1 1 7 (66 kg.)	1 3 10 (93 kg.)
Transformer Cover, Wall Con- tactor, Junction Box, Meters, etc.	3' 8" × 2' 6" × 1' 9" (111 × 76 × 53 cm.)	1 1 0 (63 kg.)	2 0 20 (110 kg.)
Four 10-gall. drums of oil ...	2' 9" × 2' 9" × 2' 2" (83 × 83 × 66 cm.)	3 2 0 (178 kg.)	4 0 10 (207 kg.)
Four Rectifying Valves	1' 2" × 1' 2" × 1' 5" (35 × 35 × 43 cm.)	0 0 6 (3 kg.)	0 0 17 (8 kg.)



WATSON & SONS

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